

SPECIFICATION AMENDMENTS

On page 1, insert above line 1, insert--Priority Claim

The present application claims priority on European Patent Application
02016092.51 filed 19 July 2002.--

On page 1, above line 1, insert--Field of the Invention--

Paragraph at line 1 of page 1 has been amended as follows:

-- The invention is directed to a process for operating an improved use of a blue flame burner..--

On page 1, above line 3, insert--Background of the Invention--

Paragraph at line 3 of page 1 has been amended as follows:

--Conventional designs of oil burner assemblies for home heating fuel oils employ a traditional fuel/air mixing process in which the evaporation and combustion of the fuel oil take place simultaneously. In one form of oil burner assembly for home heating fuel oils, the fuel oil is sprayed as a hollow cone and air is weakly swirled along a path which is parallel to the axis of a burner blast tube and which passes into the hollow cone so that the trajectories of the fuel oil droplets cross the air flow streamlines. This leads to a rapid evaporation giving fuel oil rich regions, which in turn ignite under local sub-stoichiometric conditions producing soot, and results in air pollution as well as a waste of a fossil fuel.--

Paragraph at line 17 of page 1 has been amended as follows:

--The general pattern of the flame of such an oil burner assembly is one of heterogeneity in terms of fuel concentrations; the pockets of fuel lean mixture give rise to high nitric oxide concentrations from both the fuel nitrogen and the atmospheric nitrogen, while the pockets of fuel rich mixture give rise to soot. The visible flame from such a system is yellow. The yellow ~~colour~~ color is the visible radiation from the high temperature

soot particles and this completely masks other visible radiations as far as the human eye is concerned. These soot particles result from ~~unburnt~~unburned carbon. --

Paragraph at line 28 of page 1, ending at line 7 of page 2, has been amended as follows:

-- For complete combustion of the carbon, that is soot-free combustion, the step-wise combustion of carbon to carbon dioxide via the intermediate carbon monoxide stage gives rise to a visible radiation in the blue region of the light spectrum. When this occurs the blue radiation becomes visible in a soot-free or low-luminosity flame, and oil burners for such soot-free flames are known as blue flame burners. US-A-Pat No.3545902 discloses a blue flame burner.--

Paragraph at line 8 of page 2 has been amended as follows:

-- Blue flame burners are known to have low NO_x emissions. Nevertheless there is a need for even lower NO_x emissions. ~~Especially the~~ NO_x emissions when petroleum derived fuels such as gas oil or kerosene is are used are sometimes still too high.

Paragraph at line 13 of page 2 has been amended as follows:

-- ~~The object of the present invention is a use of~~ It would be useful to provide a process for operating a blue flame burner wherein the emissions of NO_x is are reduced as compared to the prior art situation.--

Paragraph at line 16 of page 2 has been amended as follows:

-- ~~This object is achieved by the following use. Use of~~ The invention is directed to a process for operating a blue flame burner comprising burning a Fischer-Tropsch derived fuel in a blue flame burner.

On page 2, after line 17, insert--Brief Description of the Drawings

Fig. 1 shows a schematic representation of a blue flame burner with an external recirculation of flue gas.

Fig. 2 shows NO_x emissions relative to the energy as a function of different Lambda valves for oils A-D of the Example.

Fig. 3 shows carbon monoxide emissions relative to the energy as a function of different Lambda values for oils A-D of the Example.

On page 2, above line 18, insert--Detailed Description of the Invention--

Paragraph at line 27 of page 2 has been amended as follows:

-- Without wishing to be bound by the following theory applicants believe that the lower NO_x emissions can be explained by the better evaporation properties of the Fischer-Tropsch derived fuel. The resulting quicker evaporation of the liquid fuel droplets results in a lower local temperatures in the flame, which in turn results in a reduced thermal NO_x formation.--

Paragraph at line 1 of page 3 has been amended as follows:

--The blue flame burner is characterized in that the combustion of the hydrocarbon fuel to carbon dioxide is performed such that part of the flue gas is recycled to the flame and more suitably to the nozzle of the burner. Recycling part of the flue gas externally of the burner may effect such recirculation of the flue gas. Alternatively recycling may be achieved by swirling the combustible mixture of fuel and oxygen containing gas wherein at the axis of the swirling flame some recirculation of flue gas takes place. ~~Figure 1 shows a schematic representation of a blue flame burner with an external recirculation of flue gas.~~--

On page 3, delete line 11 and 12.

Paragraph at line 6 of page 4 has been amended as follows:

-- The blue flame burner using the Fischer-Tropsch fuels is preferably applied for domestic heating, wherein the heat of combustion is used to heat water by indirect heat exchange in so-called boilers. The heated water may be used to warm up the house or consumed in, for example, showers and the like. More preferably, the blue-flame burner is used in (domestic) applications wherein more than 3 starts of the burner per hour takes place. The use process of the present invention is especially suited for such applications

because low hydrocarbon and carbon monoxide emissions have been found at the start of the burner running on the Fischer-Tropsch derived fuel.--

Paragraph at line 18 of page 4 ending at line 3 of page 5, has been amended as follows:

-- The blue flame burner ~~using the~~ operated by the inventive process by burning Fischer-Tropsch fuels may advantageously be further used for direct heating of large spaces. Such applications are characterized in that the flue gasses are directly supplied to said space to heat up said space. Spaces such as as tents and halls are often heated up with such an apparatus. Normally gaseous fuels, for example, natural gas, LPG and the like, are used for this application because the associated flue gasses can be safely supplied to said space. A disadvantage of the use of gaseous fuels is, however, that handling of the pressurized gas containers and combustion equipment requires professional skills in order to operate such an apparatus safely. By ~~using~~ burning a Fischer-Tropsch derived liquid fuel, a comparable flue gas is obtained in the blue flame burner as when a gaseous fuel is used. Thus, a method is provided wherein a liquid fuel can be applied for direct heating of spaces. ~~The~~ This application of the liquid Fischer-Tropsch derived fuel makes ~~the use of~~ the apparatus for direct heating much ~~more simple~~ simpler and safer.--

Paragraph at line 4 of page 5 has been amended as follows:

--Blue flame burners are often provided with a flame detector. Examples of suitable detectors are the UV sensors and IR sensors. A more preferred detector is the so-called ~~ionisation~~ ionization sensor. An ~~ionisation~~ ionization sensor is suitable to monitor burners with intermittent operation as well as continuous operation. The principle of operation of the ~~ionisation~~ ionization flame monitor is based on the rectifying effect of a flame. If a flame is present, a current flows between the burner and the ~~ionisation~~ ionization electrode. This ~~ionisation~~ ionization current is evaluated by the flame monitor to determine if a flame is present. In some prior art applications, ~~ionisation~~ ionization sensors could not be used in combination with a liquid fuel because deposits in the sensor led to false currents in the sensor. Because ~~use of~~ burning the Fischer-Tropsch derived fuel results in ~~less~~ fewer deposits, ~~ionisation~~ ionization sensors can be applied. This is an advantage because these sensors are more readily available than the IR or UV sensors.--

Paragraph at line 22 of page 5, ending at line 5 of page 6, has been amended as follows:

-- The Fischer-Tropsch derived fuel will comprise a Fischer-Tropsch product, which may be any fraction of the middle distillate fuel range, which can be isolated from the (hydrocracked) Fischer-Tropsch synthesis product. Typical fractions will boil in the naphtha, kerosene or gas oil range. Preferably a Fischer-Tropsch product in the kerosene or gas oil range is used because these fractions are easier to handle in, for example, domestic environments. Such products will suitably comprise a fraction larger than 90 wt% which boils between 160 and 400 °C, preferably to about 370 °C. Examples of Fischer-Tropsch derived kerosene and gas oils are described in EP-A-583836, WO-A-9714768, WO-A-9714769, WO-A-011116, WO-A-011117, WO-A-0183406, WO-A-0183648, WO-A-0183647, WO-A-0183641, WO-A-0020535, WO-A-0020534, EP-A-1101813, US-A-Pat No. 5766274, US-A-Pat No 5378348, US-A-Pat No 5888376 and US-A-Pat No 6204426.--

Paragraph at line 6 of page 6, has been amended as follows:

-- The Fischer-Tropsch product will suitably contain more than 80 wt% and preferably more than 90 wt% iso and normal paraffins and less than 1 wt% aromatics, the balance being naphthenics compounds. The content of ~~sulphur~~ sulfur and nitrogen will be very low and normally below the detection limits for such compounds. This low content of these elements is due to the specific process wherein the Fischer-Tropsch reaction is performed. The content of ~~sulphur~~ sulfur will therefore be below 5 ppm and the content of nitrogen will be below 1 ppm. As a result of the low contents of aromatics and naphthenics compounds the density of the Fischer-Tropsch product will be lower than the conventional mineral derived fuels. The density will be between 0.65 and 0.8 g/cm³ at 15 °C. --

Paragraph at line 20 of page 6, ending at line 7 of page 7, has been amended as follows:

-- The fuel used in the process of the present invention may also comprise fuel fractions other than the Fischer-Tropsch derived product. Examples of such fractions may be the kerosene or gas oil fractions as obtained in traditional refinery processes, which upgrade crude petroleum feedstock to useful products. Preferred non-Fischer-Tropsch fuel components are the ultra low ~~sulphur~~ sulfur (e.g. less than 50 ppm ~~sulphur~~ sulfur) kerosene or diesel fractions, which are currently on the market. Optionally non-mineral oil based fuels, such as bio-fuels, may also be present in the fuel composition. The content of the Fischer-Tropsch derived product in the fuel will be preferably be above 40 wt%, more

preferably above 60 wt% and most preferably above 80 wt%. It should be understood that the content of such, currently less available, Fischer-Tropsch product will be ~~optimised~~ optimized, wherein pricing of the total fuel will be balanced with the advantages of the present invention. For some applications, fuels fully based on a Fischer-Tropsch product plus optionally some additives may be advantageously used.--

Paragraph at line 8 of page 7 has been amended as follows:

-- The fuel may also comprise one or more of the following additives: detergents, ~~Detergents~~, for example OMA 350 as obtained from Octel OY; stabilizers, for example Keropon ES 3500 as obtained from BASF Aktiengesellschaft, FOA 528A as obtained from OCTEL OY; metal-deactivators, for example IRGAMET 30 (as obtained from Speciality Chemicals Inc; (ashless) dispersants, for example as included in the FOA 528 A package as obtained from Octel OY; anti-oxidants; IRGANOX L57 as obtained from Speciality Chemicals Inc; cold flow improvers, for example Keroflux 3283 as obtained from BASF Aktiengesellschaft, R433 or R474 as obtained from Infineum UK Ltd; combustion improver, for example ferrocene, methylcyclopentadienyl-manganese-tricarbonyl (MMT); anti-corrosion: Additin RC 4801 as obtained from Rhein Chemie GmbH, Kerocorr 3232 as obtained from BASF, SARKOSYL 0 as obtained from Ciba; re-odorants, for example Compensol as obtained from Haarman & Reiner; biocides, for example GROTA MAR 71 as obtained from Schuelke & Mayr; lubricity enhancers, for example OLI 9000 as obtained from Octel; dehazers, for example T-9318 from Petrolite; antistatic agents, for example Stadis 450 from Octel; and foam reducers, for example TEGO 2079 from Goldschmidt.--

Paragraph at line 31 of page 7, ending at line 3 of page 8, has been amended as follows:

-- The Fischer-Tropsch derived fuel is ~~colourless~~ colorless and odorless ~~odeurless~~. For safety reasons, an ~~odeur~~ odor marker, as for example applied in natural gas for domestic consumption, may be present in the Fischer-Tropsch derived fuel. Also a ~~colour~~ color marker may be present to distinguish the fuel from other non-Fischer-Tropsch derived fuels. --

Table 1 has been amended as follows:

Table 1

	Fischer-Tropsch kerosene (A)	Fischer-Tropsch gas oil (B)	Reference oil-1 (C)	Reference oil-2 (D)
Density (at 15 °C in kg/m ³)	734.8	785.2	854.3	846.3
Sulphur Sulfur content (wt%)	0.0005	< 0.0005	0.142	0.061
Kinematic viscosity at 20 °C (mm ² /s)	1.246	6.444	3.842	4.621
Flash point (°C)	43	92	64	66

Paragraph at line 2 of page 9 has been amended as follows:

-- During the experiment, the NO_x content was measured by chemoluminescence. In Figure 2 the NO_x emission relative to the energy is shown at different Lambda values for the fuels oils A-D. The energy in kWh is calculated from the amount of fuel fed to the burner and its caloric value. It is clear that the NO_x emissions are lower for the Fischer-Tropsch derived ~~fuels~~ oils as compared to when a normal gas oil or an ultra low sulphur gas oil is used.--

Paragraph at line 10 of page 9 has been amended as follows:

-- The carbon monoxide emission was also measured. In Figure 3 the CO emission relative to the energy is presented for different values of lambda for oils A-D.--

On page 10, above line 1, insert --We claim:--